

CROSS-BORDER COFFEE BREAK

THE ECONOMIC AND BUSINESS
IMPACTS OF ARTIFICIAL
INTELLIGENCE: REALITY, NOT HYPE



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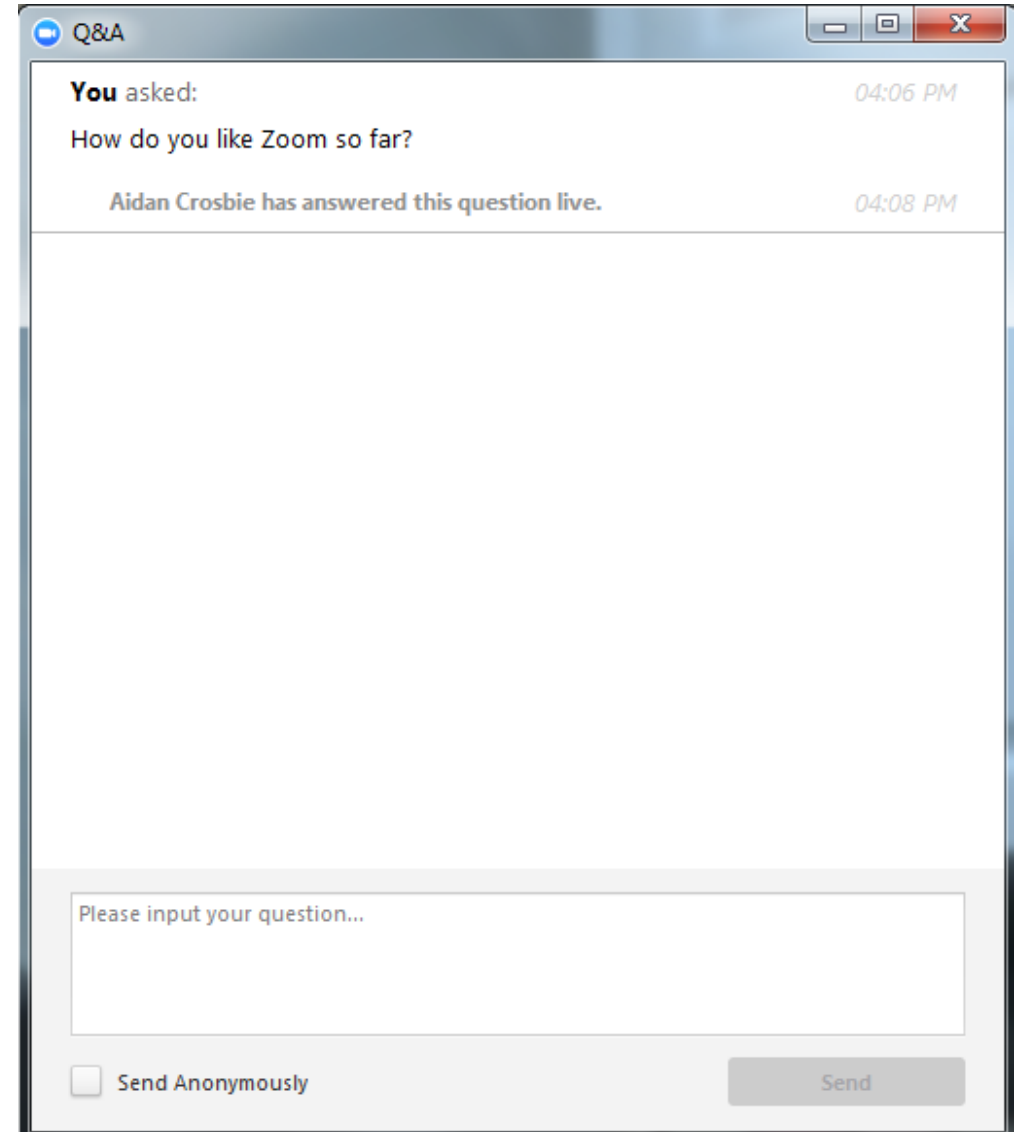
PRESENTER



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HOW TO SUBMIT A QUESTION ON ZOOM



Welcome to the Cross-Border Coffee Break

This lecture:

Introduction: AI and the AI-Boom

- I. The Hyperbole and the Hysteria
 - ✓ *the Google-effect, Singularity-effect, Elon Musk-effect and the Robot-effect*
- II. Immediate Impacts: *The Race Against the Robots*
 - ✓ *the robots lose against very slow humans*
- III. Existential and Imaginary Impacts
 - ✓ *rather beware of human stupidity than of artificial intelligence*
- IV. Take Aways
 - ✓ *prepare for another AI winter*

Introduction: What is AI?

“There’s no agreement on what intelligence is even among intelligent intelligence researchers!”

-Max Tegmark, 2017

“Machines that act intelligently...when a machine can make the right decision in uncertain circumstances”

-New Scientist, 2017: 3

Introduction: AI is Back - The New World of AI

The number of calculations a common computer chip can perform is already at least ten million times faster than the human brain: 1016 calculations per second for human brains versus 2 GHz (2 billion per second) for computer chips ...

- Embodied (e.g. robots, co-bots)
- Disembodied (e.g. chatbots)

Autonomous vehicles

Telecommunications

Medical diagnostics

Surveillance, security

Entertainment & sports

Marketing & advertising

Prototyping

Autonomous Innovation

Computing power and cost (Moore's Law)

Cloud Computing and IoT

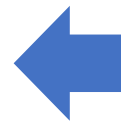
>8 billion "things" connected

Machine Learning -deep learning (2006)

"Narrow" AI

Big Data

2,5 quintillion bytes of data (10^{18}) created daily in 2017



Computer vision



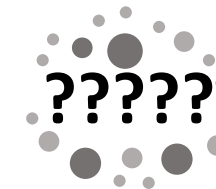
Language processing



Speech & recognition



Business intelligence



Artificial General Intelligence?

AI Hyperbole and Hysteria

Immediate Impacts

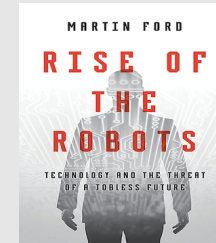
Hyperbole

Google effect



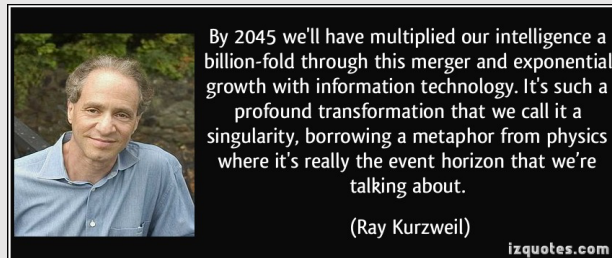
Hysteria

Robot effect



Imagined Impacts

Singularity effect



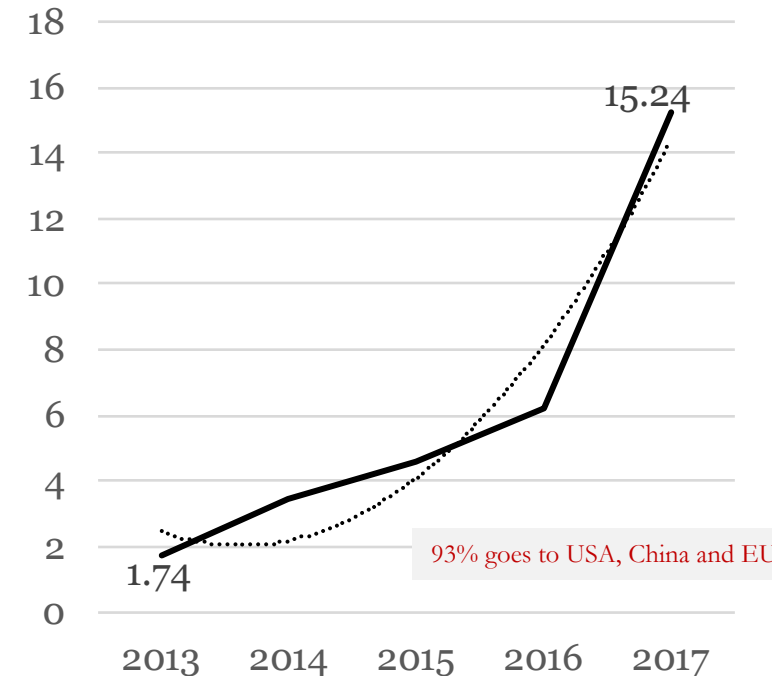
Elon Musk effect



Immediate Impacts – the Google Effect

- Claims of massive business revenue (see Kelly Thomas, 2019)
 - “Global business value derived from artificial intelligence (AI) is projected to total \$1.2 trillion in 2018.
 - AI-derived business value is forecast to reach \$3.9 trillion in 2022”
- Claims of large GDP and productivity gains (from Accenture):
 - “AI could double annual economic growth rates in 2035 by changing the nature of work and creating a new relationship between man and machine.
 - The impact of AI technologies on business is projected to increase labor productivity by up to 40 percent and enable people to make more efficient use of their time”.

Worldwide investment into AI start-up firms, 2013-2017 (US\$ billions)

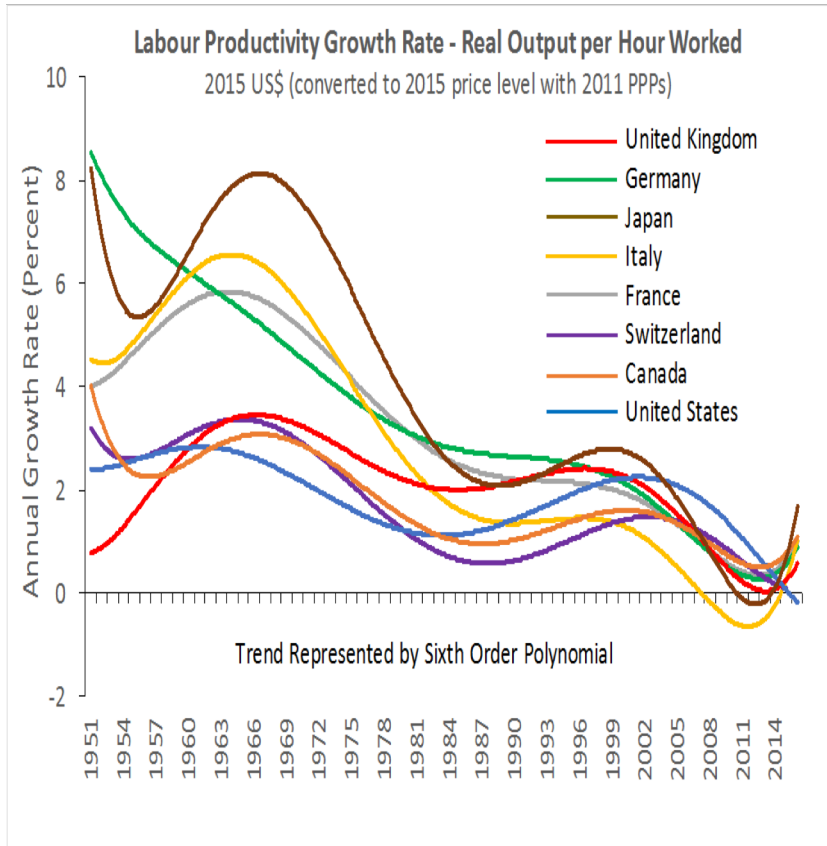


(Source: Author's compilation based on data from Statista, 2018)

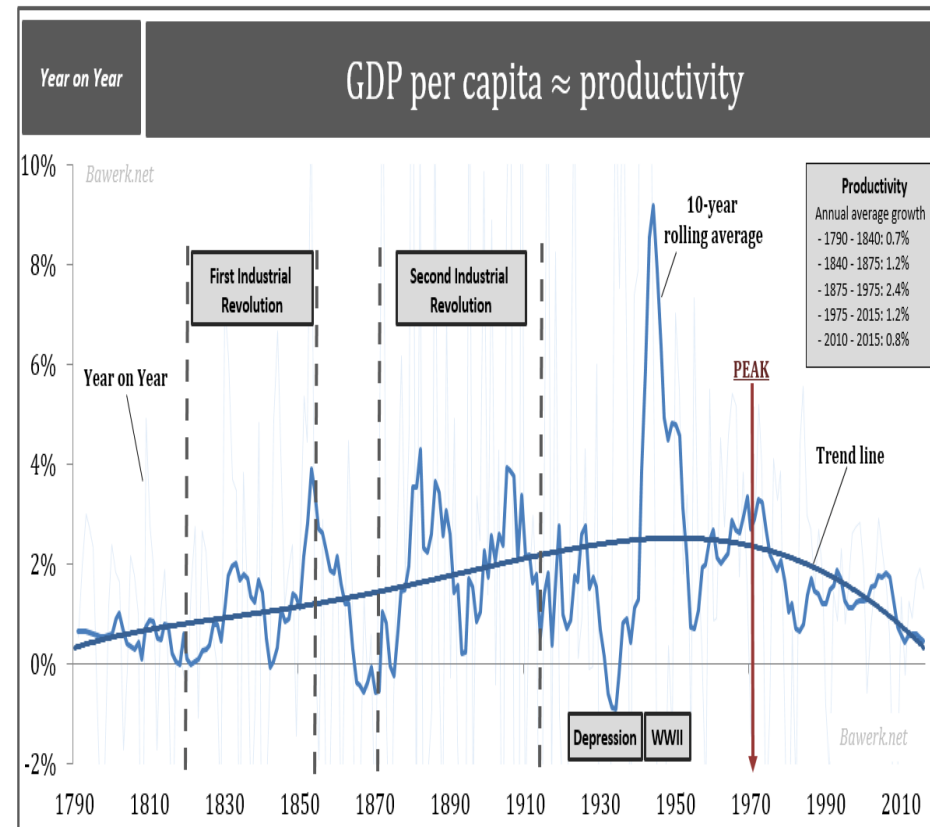
See: <https://towardsdatascience.com/artificial-intelligence-and-business-value-ce70083b228f> and see: <https://www.accenture.com/sk-en/insight-artificial-intelligence-future-growth>

Immediate Impacts – Google Effect Re-Evaluated

1. Where is the productivity growth and economic growth so far?



Source <https://www.camecon.com/blog/geographical-dimension-productivity-problem/>



Source: <https://bawerk.net/2015/08/22/that-70s-show-episode-3/>

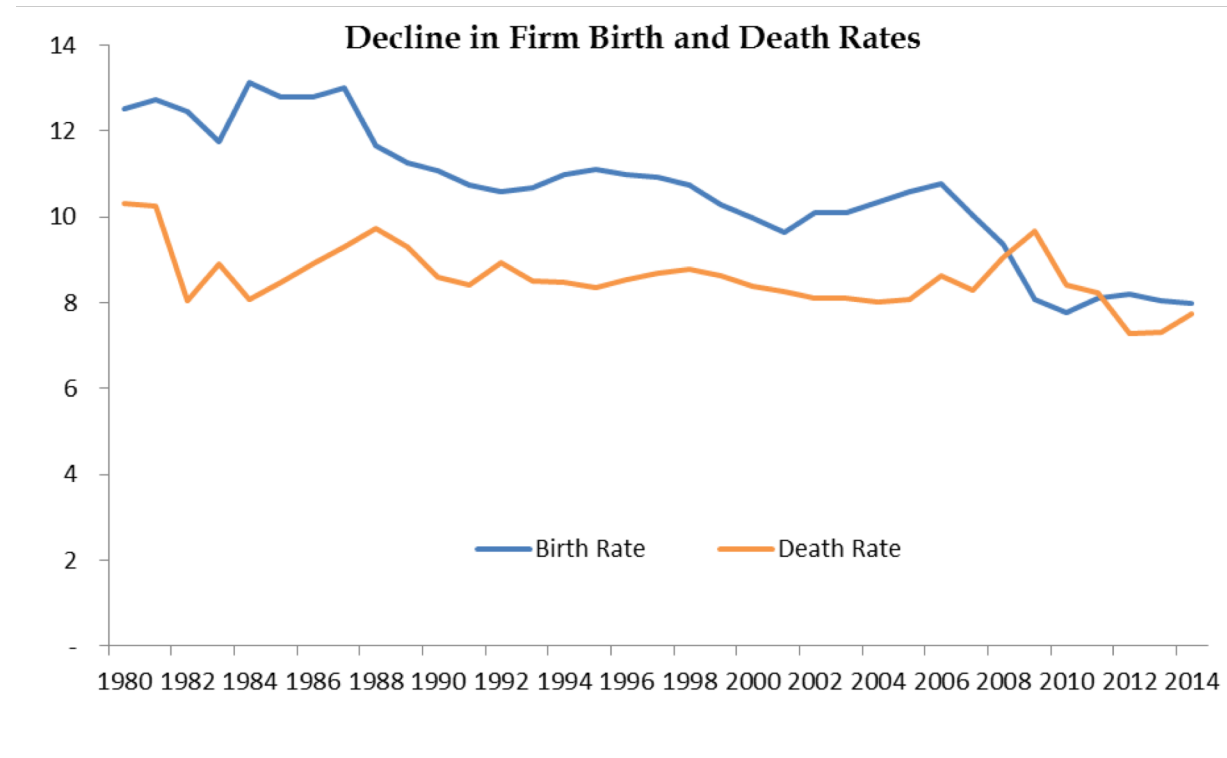
Explanations:

1. *The digital / AI revolution does not have impact* ; Innovation gets more difficult. (e.g. Gordon, 2018; Cowen, 2016; Komlos 2014);
2. *Implementation lags* – the effects are still to come (Brynjolfsson et al 2017). *Diffusion is slow* (Andrews et al, 2016).
3. *Mismeasurement* – digital products generate huge surpluses that are not accounted properly.
4. *Demand side constraints* – the declining labor share is limiting consumption, investment causing stagnation (Gries and Naudé, 2018).

Immediate Impacts – Google Effect Re-Evaluated

2. Where is the business impact?

- **Declining business dynamism** (Decker et al., 2016) also in high-tech.
- **Fading Stars** (Gutierrez and Philippon, 2019): “super stars firms have not become larger, have not become more productive, and the contribution of star firms to aggregate U.S. productivity growth has fallen by more than one third since 2000.”



From Charles Hughes at <https://economics21.org/html/stagnation-stunting-economic-growth-2269.html>

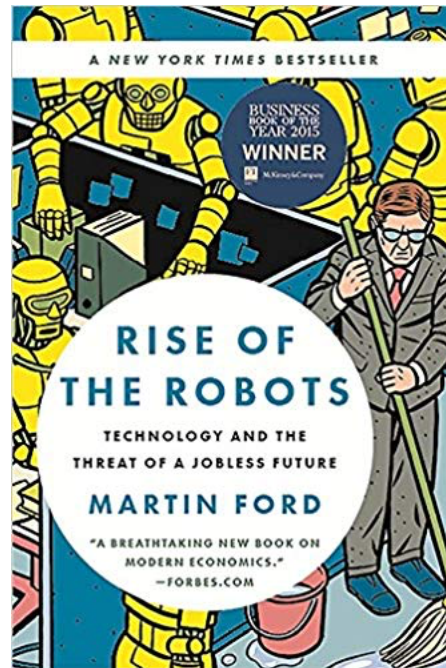
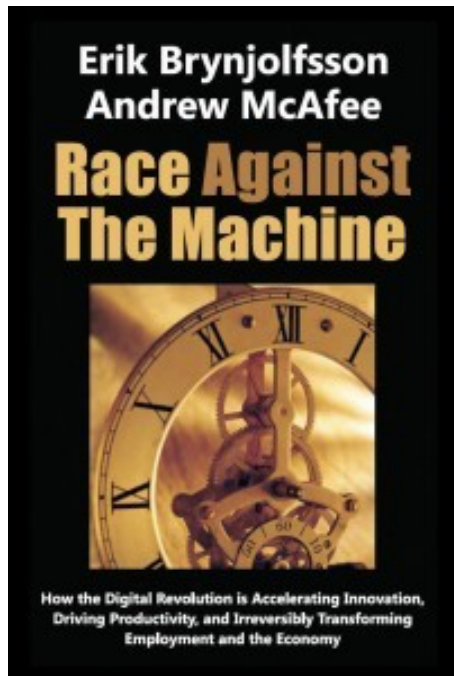
Immediate Impacts – Google Effect Re-Evaluated

1. **Diffusion** of AI may be much slower than thought previously:
 - a) It is especially difficult for [small firms](#) to economically implement AI (Bergstein, 2019).
 - b) Complementary investments are needed (Brynjolfsson et al., 2017).
 - c) Sunk investments (Brooks, 2017).
 - d) Pseudo AI (Solon, 2018, MacMillan, 2018).
2. The tempo of **innovation** in AI is slowing down (Hao, 2019).
 - a) Deep learning is only narrowly focused on computer vision, natural language processing, online marketing customisation mostly in only three regions of the world (WIPO, 2019).
 - b) Machine learning is facing a “reproducibility crisis” (Allen, 2019).
 - c) End of Moore’s Law in sight (Waldrop, 2016).
3. AI innovation has been more of Schumpeterian “destruction” than “creation” i.e. characterized by innovation in complementary products and services rather than novel (Komlos, 2014).) “most new technologies today generate **only marginal improvements** in well-being” (Cowen, 2016:43).

Immediate Impacts – The “Robot Effect”

“AI will Put 10 million Jobs at High Risk - More Than Were Eliminated by the Great Recession”

– CB Insights (2017)



Initial Predictions of the impact of automation on jobs:

- 47 percent of USA jobs could be automated in 10 to 20 years (Frey and Osborne (2013, 2017) .
- 54 percent for the EU (Bowles (2017).
- 66 per cent in developing countries (World Bank, 2016).
- 1 additional robot per 1,000 workers will reduce the employment: population ratio in the USA by **0,37%** (Acemoglu and Restrepo, 2017) and in EU employment by between **0,16%** to **0,20%** (Chiacchio et al. 2018).

What about your job? See e.g. <https://willrobotstakemyjob.com>

Immediate Impacts – Robocalypse Re-Evaluated

1. **Methods** used to calculate potential job losses in initial reports, e.g. by Frey and Osborne (2013, 2017) are sensitive to assumptions used. See e.g. Arntz et al. (2016, 2017) (9%).
2. Automation may affect **tasks**, rather than jobs (Autor, 2015). Job churning in the USA is at historically low levels – if AI destroyed jobs, job churning would increase, not decrease (see Atkinson and Wu, 2017).
3. **Net job creation** may be positive as automation (also by AI) lead to creation of new jobs or jobs in other sectors than those negatively affected. There are an “*Uber effect*,” a “*Walmart effect*” and a “*Costco*” effect that re-instate jobs (Autor and Salomons, 2018).
 - a) Eg. automation created 1,5 million net new jobs between 1999 and 2010 in Europe (Gregory et al., 2019). Cords and Prettnner (2019) : 1 new robot causes 1.66 low-skilled manuf job losses, but creates 3,42 new high-skilled manuf jobs in Germany.

Imaginary Impacts:

The Fallacy of the Giant Cheesecake

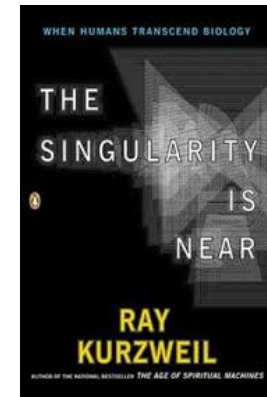
“Now it’s clear, that if you’re baking a cheesecake, how large a cheesecake you can bake depends on your intelligence. A superintelligence could build enormous cheesecakes - cheesecakes the size of cities. And Moore’s Law keeps dropping the cost of computing power. By golly, the future will be full of giant cheesecakes!”

-Eliezer Yudkowsky, 2006

Control problem: “the problem of how to control what the superintelligence would do” in other words the challenge to “design AI systems such that they do what their designers intend” (Bostrom, 2017: v, 5).

Political problem: “how to achieve a situation in which individuals or institutions empowered by such AI use it in ways that promote the common good” (Bostrom, 2017:5).

- Prevent that any self-interested group monopolizes the benefits of an AGI for itself (Bostrom, 2017).
- Reduce the damages from *Moore’s Law of Mad Science* (Every 18 months, the minimum IQ necessary to destroy the world drops by one point” (Yudkowsky, 2008:338).)



FT Series
The AI arms race



Imaginary Impacts:

Control and Political Problems (alignment)

Is the alignment problem a real problem?

No : because we will become one with the AI

“It’s not us versus the AIs, which has been the theme of many AI futurist dystopian movies. We are going to merge with it. We already have...”

-Ray Kurzweil (in Ford, 2018:243).

No : because we will slowly arrive at an AGI through trial and error

“...artificial intelligence is like any other technology. It is developed incrementally, designed to satisfy multiple conditions, tested before it is implemented, and constantly tweaked for efficacy and safety”

-Steven Pinker (2018:300).

Yes : because we need better governance of AI technology

“open letter on artificial intelligence” in 2016 by > 1,000 AI scientists

Imaginary Impacts:

Control and Political Problems (alignment)

Is the alignment problem a real problem? Will the Singularity arrive in 2045?

1. The complexity brake: Understanding the neural structure of the human brain is getting harder as we learn more. *Improved technologies for observing and probing biological systems has only led to discoveries of further levels of complexity that need to be dealt with* (Paul Allen, 2019; Allen and Greaves, Koch, 2012)
 - a. The mind is synchronized, but no one knows how.
 - b. The theory of anesthesia contradicts the notion that consciousness arises from firing neurons.
 - c. Understanding consciousness may require new (quantum?) physics (Penrose, 1989).
See <https://www.wired.com/2008/03/ff-kurzweil-sb/>

No : because we will not
in the foreseeable future
invent an AGI

2. Another AI winter may be approaching:
 - a. Deep learning is facing decreasing returns (Hao, 2019).
 - b. Machine learning is facing a “reproducibility crisis” (Allen, 2019)
 - c. Innovation is getting harder as a result of the burden of knowledge (Jones, 2009).
 - d. Moore’s Law is not expected to hold for much longer (Waldrop, 2016).
 - e. We see the rise of pseudo-AI (Solon, 2018, MacMillan, 2018).

Overall Take-Aways

- Machine learning (and deep learning) is nowhere near human intelligence and subject to decreasing returns.
- It is only relatively few firms and countries driving AI innovation.
- The core AI functionalities being developed (mostly computer vision and language) are limited (vision and speech and business process optimization).
- The diffusion of AI is slow and expensive.
- There is little evidence, and prospects, for mass replacement of jobs by automation.
- There is little prospects soon for a AGI / Singularity.

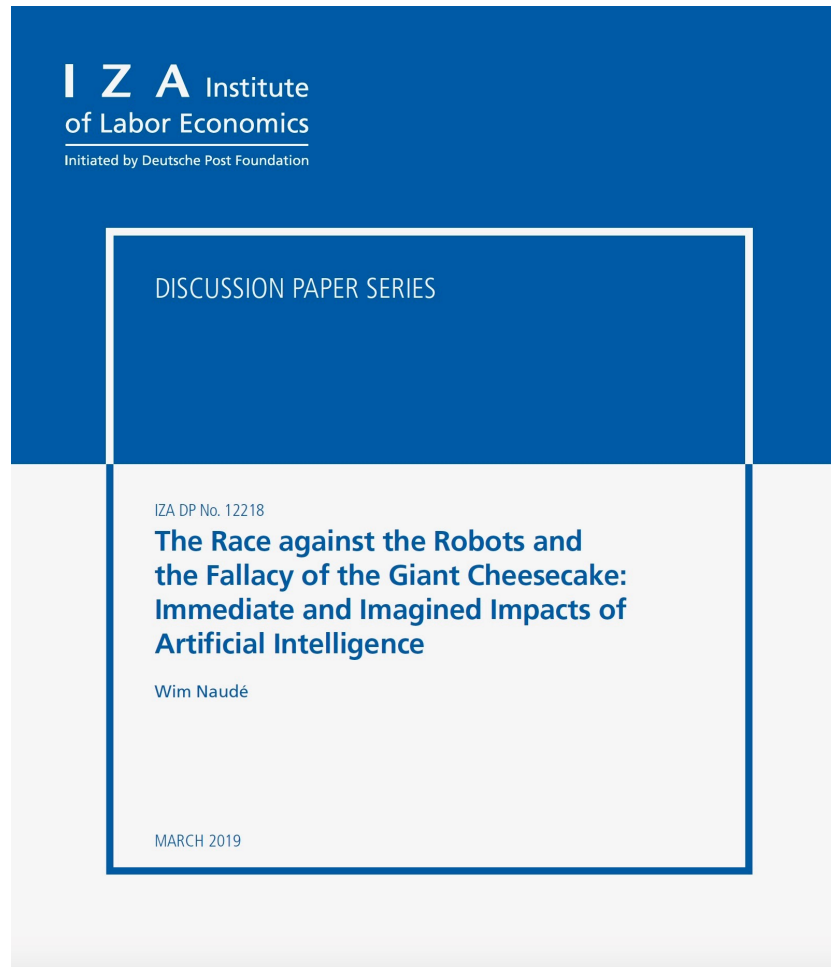
An AI misinformation epidemic?

- A 2018 Poll by the Pew Research Center found that 65 percent of Americans still believe that their jobs will be taken over by robots and computers within 50 years.
- The current media discourse about AI is “*unhinged*” (Schwartz,2018).
- Based on misinformation, AI research and innovation can be pre-maturely stifled by attempts at global regulation: e.g.
 - United Nations University’s Centre for Policy Research ([CPR](#)) claims that AI is:
 - “transforming the geopolitical order” and even more [incredibly](#) that
 - “a shift in the balance of power between intelligent machines and humans is already visible”.
 - Its blog have [called](#) for “an Intergovernmental Panel for Artificial Intelligence” [and](#) for a “UN-led multi-stakeholder global governance regime”.

AI Winter

- The Hyperbole and Hysteria is contributing to AI winter as
 - Hyperbole will lead to loss in trust in AI as unrealistic predictions cannot be attained.
 - Hysteria will lead to loss in trust in AI as AI becomes feared for creating job losses, inequality and potentially Armageddon.
- This is unwelcome as the world needs more, not less, technological innovation, and the more rapid spread and uptake of such technology.

A Cure for the Misinformation Epidemic:



Thank you



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QUESTION & ANSWER



GBSN Cross-Border Coffee Breaks

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